Optimisation of squalene recovery from palm oil by-product using integrated sc-CO2-pressure swing

ABSTRACT

Squalene is used as an ingredient in functional foods, pharmaceuticals, and cosmetics. Due to the limitation of squalene availability from predominant source which is shark liver oil and to sustain the environment by fully utilising the by-product of palm oil, an effort has been made to find a potential source of squalene as an alternative to shark liver oil. The motivation for this work is to optimise its extraction from an alternative source, a palm oil by-product known as palm fatty acid distillate (PFAD), using supercritical carbon dioxide (sc-CO2) with the aid of a pressure swing technique. The measurements were performed using a sc-CO2 extraction in a fixed bed at temperatures of 40°C, 50°C, and 60°C, pressures of 20, 30 and 40 MPa, and holding times of 20, 30 and 40 min; high performance liquid chromatography (HPLC) was used for squalene content analysis, optimised with a central composite design using research surface methodology (RSM). The second-order polynomial mathematical model adequately fitted the experimental results. The maximum squalene content from the model was predicted to be 356.24 ppm under the set of conditions with pressure of 23 MPa, temperature at 40°C, and 20 min holding time.

Keyword: Palm fatty acid distillate; Pressure swing technique; Sc-CO2; Squalene